

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1. (Currently Amended) A process for recovering copper from an alkaline etch bath from an etching process in which printed boards electroplated with copper are etched with the alkaline etch bath and then rinsed with water, comprising the steps of removing the copper being removed from the alkaline etch bath by:

extraction extracting the alkaline etch bath with an organic solution containing a reagent, which forms with copper a complex compound, which is extracted by the organic solution,

recirculating the alkaline etch bath ~~being recirculated~~ to renewed etching, contacting the copper-containing organic solution ~~being contacted, in a retraction step, in a re-extraction step~~ with an aqueous solution of an acid so that copper passes from the organic solution to the aqueous solution to form a copper-containing solution,

recirculating and the organic solution ~~being recirculated~~ from the re-extraction step to renewed extraction, ~~characterised by the steps of~~

passing the copper-containing acid solution obtained from the re-extraction step to a copper recovery operation,

diverting a flow from the copper-containing acid solution before the operation for recovering copper from ~~the same~~ the copper-containing acid solution, and

adjusting the copper content of said flow so that it will be lower than the copper content of the acid solution which is used in the copper recovery operation,

and recirculating said flow having an adjusted copper content to the operation for electroplating printed boards for use therein.

Claim 2. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by also removing wherein~~ copper ~~is also removed~~ from the rinsing water from the etching process by extraction with an organic solution containing a reagent, which forms with copper a complex compound which is extracted by the organic solution.

Claim 3. (Currently Amended) ~~A~~ The process as claimed in claim 2, ~~characterised by further comprises~~ using the same organic solution for the rinsing water as for the alkaline etch bath, and
first removing copper from the alkaline etch bath,
then contacting the thus obtained copper-containing organic solution with the rinsing water, and
subsequently subjecting the organic solution to said re-extraction.

Claim 4. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by further comprising~~ using the same organic solution for the rinsing water as for the alkaline etch bath, and
first removing copper from the rinsing water,
then contacting the thus obtained copper-containing organic solution with the alkaline etch bath and,
subsequently subjecting the organic solution to said re-extraction.

Claim 5. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by further comprising~~ carrying it out said process as in a closed ~~process~~ circuit, in which the electroplated printed board is etched with said alkaline etch bath and the acid solution from the electroplating is used for said re-extraction step.

Claim 6. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by further comprising~~ adjusting the copper content so that the ratio of copper

content of said acid solution is ~~> 0.3:1~~ flow:copper content of said acid solution is >0.3:1.

Claim 7. (Currently Amended) ~~A~~ The process as claimed in claim 6, characterised by further comprising adjusting the copper content so that the said ratio is in the range of 0.60:1 - 0.95:1.

Claim 8. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising carrying out the electroplating in the form of pulse plating with wave-shaped pulses of current intensity.

Claim 9. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising carrying out the electroplating in the form of pulse plating with pole reversal.

Claim 10. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising carrying out the pulse plating with a pulse length of the wave-shaped pulses in the range of 1-500 ms.

Claim 11. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising adjusting the period of time during which the printed board acts as cathode in the pulse plating to a value in the range of 1-200 s.

Claim 12. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising adjusting the period of time during which the printed board acts as anode in the pulse plating to a value in the range of 0.1-20 s.

Claim 13. (Currently Amended) ~~A~~ The process as claimed in claim 8, ~~characterised in that~~ wherein the maximum current intensity during the period of time when the printed board acts as cathode in the pulse plating is 10 A/dm².

Claim 14. (Currently Amended) ~~A~~ The process as claimed in claim 8, ~~characterised in that~~ wherein the maximum current intensity during the period of time when the printed board acts as anode in the pulse plating is 40 A/dm².

Claim 15. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by~~ further comprising adjusting the copper content of the flow which is recirculated to the electroplating by the addition of acid from the re-extraction step.

Claim 16. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by~~ further comprising adjusting the copper content of the flow which is recirculated to the electroplating to a value in the range of 5-100 g/l.

Claim 17. (Currently Amended) ~~A~~ The process as claimed in claim 16, ~~characterised by~~ further comprising adjusting said copper content to a value in the range of 15-30 g/l.

Claim 18. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised by~~ adjusting the content of anion from the used acid to a value in the range of 25-250 g/l in the flow which is used in the electroplating.

Claim 19. (Currently Amended) ~~A~~ The process as claimed in claim 1, ~~characterised in that~~ wherein the content of anion from the used acid is substantially the same in the copper recovery operation as in the electroplating operation.

Claim 20. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising carrying out the pulse plating without any additives of the kind which is used in non-pulse plating of printed boards.

Claim 21. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising reducing the any content of alkaline substance originating from the etch bath and/or reducing the any content of organic material originating from the extraction in the flow which is recirculated to the electroplating before subjecting the same to said electroplating.

Claim 22. (Currently Amended) ~~A~~ The process as claimed in claim 21, characterised by further comprising carrying out said ~~reduction(-s)~~ reductions by means of one or more separate water washing steps in connection with the equipment which is used for the extraction.

Claim 23. (Currently Amended) ~~A~~ The process as claimed in claim 21, characterised by further comprising carrying out said ~~reduction(-s)~~ reductions by means of one or more filters and/or ultrafilters.

Claim 24. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising removing any colloidal copper before the electroplating from the flow which is recirculated to the electroplating.

Claim 25. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising using as equipment for said extraction one or more extractors ~~of the type~~ in which the separation takes place by means of energy supplied from the outside.

Claim 26. (Currently Amended) ~~A~~ The process according to claim 1, wherein said alkaline etch ~~both~~ bath is an ammoniacal etch bath.

Claim 27. (Currently Amended) ~~A~~ The process according to claim 1, wherein said acid of said aqueous solution of an acid is sulphuric acid.

Claim 28. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising adjusting the copper content so that the ratio of copper content of said acid solution is ~~>0.5:1~~ flow:copper content of said acid solution is >0.5:1.

Claim 29. (Currently Amended) ~~A~~ The process as claimed in claim 6, characterised by further comprising adjusting the copper content so that ~~the~~ said ratio is in the range of 0.75:1 - 0.95:1.

Claim 30. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising carrying out the electroplating in the form of pulse plating with square pulses of current intensity.

Claim 31. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising carrying out the pulse plating with a pulse length of the wave-shaped pulses in the range of 10-50 ms.

Claim 32. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising adjusting the period of time during which the printed board acts as cathode in the pulse plating to a value in the range of 10-100 s.

Claim 33. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised by further comprising adjusting the period of time during which the printed board acts as anode in the pulse plating to a value in the range of 1-10 s.

Claim 34. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised ~~in that~~ wherein the maximum current intensity during the period of time when the printed board acts as cathode in the pulse plating is 5 A/dm².

Claim 35. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised ~~in that~~ wherein the maximum current intensity during the period of time when the printed board acts as cathode in the pulse plating is 3 A/dm².

Claim 36. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised ~~in that~~ wherein the maximum current intensity during the period of time when the printed board acts as anode in the pulse plating is 10 A/dm².

Claim 37. (Currently Amended) ~~A~~ The process as claimed in claim 8, characterised ~~in that~~ wherein the maximum current intensity during the period of time when the printed board acts as anode in the pulse plating is 5 A/dm².

Claim 38. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising adjusting the copper content of the flow which is recirculated to the electroplating to a value in the range of 10-50 g/l.

Claim 39. (Currently Amended) ~~A~~ The process as claimed in claim 16, characterised by further comprising adjusting said copper content to a value in the range of 20-25 g/l.

Claim 40. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising adjusting the content of anion from the used acid to a value in the range of 50-200 g/l in the flow which is used in the electroplating.

Claim 41. (Currently Amended) ~~A~~ The process as claimed in claim 21, characterised by further comprising carrying out said ~~reduction (-s)~~ reductions by means of one or more charcoal filters and/or ultrafilters.

Claim 42. (Currently Amended) ~~A~~ The process as claimed in claim 22, characterised by further comprising carrying out said ~~reduction (-s)~~ reductions by means of one or more filters and/or ultrafilters.

Claim 43. (Currently Amended) ~~A~~ The process as claimed in claim 1, characterised by further comprising removing any colloidal copper before the electroplating by means of one or more ultrafilters from the flow which is recirculated to the electroplating.